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GEOMETRY.

311. Proposed by J. OWEN MAHONEY, B. E., M. Sc., Dallas High School, Dallas, Texas.

Triangle ABC is obtuse-angled at C ; x, y, z are squares on the sides AC, CB, BA ; MN and QR are lines joining adjacent sides of x, z and y, z . The common chord of the circles on MN and QR as diameters passes through C and the mid-point of NR .

312. Proposed by F. H. SAFFORD, Ph. D., The University of Pennsylvania, Philadelphia, Pa.

A variable circle passes through a fixed point and is tangent to a given circle. If a diameter of the first circle passes through the fixed point find the locus of its other extremity.

CALCULUS.

235. Proposed by C. N. SCHMALL, 89 Columbia Street, New York City.

The latitude of a place and two circles parallel to the horizon being given, to determine the declination of a heavenly body whose apparent time of passage from one circle to the other shall be a minimum.

236. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

Solve the partial differential equation, $x \frac{\partial^2 u}{\partial x^2} + y \frac{\partial^2 u}{\partial x \partial y} = \frac{\partial u}{\partial x}$.

MECHANICS.

199. Proposed by G. B. M. ZERR, Ph. D., Parsons, W. Va.

A sphere of water, radius $\frac{1}{49}$, the earth's radius, is brought together by mutual attractions of particles from a state of infinite diffusion. Find its temperature owing to the amount of work done by these forces.

AVERAGE AND PROBABILITY.

186. Proposed by G. B. M. ZERR, Ph. D., Parsons, W. Va.

An urn contains $n=100$ balls; $a=25$ balls are stamped, at random, with the letter A ; $b=30$ balls are stamped, at random, with the letter B ; $c=40$ balls are stamped, at random, with the letter C ; $d=50$ balls are stamped, at random, with the letter D . One ball is drawn at random; find the chance it has on it no letter, the letter A , or B , or C , or D , or the letters $AB, AC, AD, BC, BD, CD, ABC, ABD, ACD, BCD$, or $ABCD$.